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Science and Technology for Tomorrow's Air and Space Force

Success Story

MANTECH SAVORS INITIAL FLIGHT TEST SUCCESS FOR MEMS-BASED IMU IN PRECISION-GUIDED MUNITIONS



The HG-1900 Microelectromechanical Systems MEMS-based Inertial Measurement Units (IMU), chosen for the NetFires Precision Attack Missile (PAM) program, represents reduced size and weight, needs less power, and is easier to produce and more affordable than any other existing tactical grade IMU. It is a proven, IMU suitable for a wide variety of smart missiles and munitions of a smaller size, making it more appealing in improving surgical strike capabilities.



Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

Officials from the Manufacturing Technology (ManTech) Division of the Materials and Manufacturing Directorate have scored a huge success in the joint Air Force/Navy ManTech program, Affordable MEMS-based IMUs for Missiles and Munitions. The Army High-G MEMS IMU program builds on the success of the ManTech program by developing a G-hardened MEMS IMU, which will ultimately meet the performance requirements of 90% of Department of Defense (DoD) tactical munitions and missiles. NetFires PAM, when implemented, will provide the Army with extended-range precision munitions for deployable ground forces against hard targets such as tanks and command and control vehicles.

Specific Army ManTech successes include the transition from the HG-1900 to a high-G hardened HG-1920, the qualification of a new MEMS foundry, and reduction in overall piece part count and, thereby, price of the current IMU. By working this program in a joint manner, the Army takes advantage of early Air Force/Navy successes and advances the MEMS-IMU to DoD-wide applications.

During the 75-sec flight, the PAM flew to an altitude of approximately 20,000 ft and successfully executed a number of test maneuvers using the navigation unit that consisted of the HG-1900 (MEMS-based) IMU integrated with a global positioning system receiver. The demonstration also included success in updating the missile's guidance point in mid-flight, resulting in a successful intercept. With the success of this flight test, the Army's PAM developer, Raytheon, named the ManTech program's HG-1900, developed by Honeywell, as the baseline IMU for the NetFires PAM program.

Background

Manufacturers use micro-machining techniques to produce electrically driven, miniature mechanical structures called MEMS. In the case of silicon-based MEMS such as those used in the HG-1900, the manufacturer performs micro-machining using standard integrated circuit (IC) fabrication techniques. This allows silicon-based MEMS to leverage the existing IC industry, enabling the mass production of precision devices.

The MEMS-based HG-1900, is suitable for a variety of commercial guidance and navigation systems. A prime goal of the ManTech program has been to develop a MEMS process that allows for wider adoption and implementation through technology transition into the commercial arena, as well as into additional military applications.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-50)